BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(19)【発行国】日本国特許庁（ＪＰ）

(12)【公報種別】公開特許公報（Ａ）

(11)【公開番号】特開２０００－２１１００８（Ｐ２０００－２１１００８Ａ）

(43)【公開日】平成１２年８月２日（２０００．８．２）

(54)【発明の名称】三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレン（ＢＯＰＰ）パール光沢合成紙の製造方法

(51)【国際特許分類第７版】 B29C 47/06 47/88 55/12 71/04 B32B 5/18 27/10 27/32 // B29K 23:00 105:04 105:16 B29L 7:00 9:00

【ＦＩ】 B29C 47/06 47/88 Z 55/12 71/04 B32B 5/18 27/10 27/32 Z

【審査請求】未請求

【請求項の数】１

【出願形態】ＯＬ

【全頁数】７

(21)【出願番号】特願平１１－１５３６５

(22)【出願日】平成１１年１月２５日（１９９９．１．２５）

(71)【出願人】

【識別番号】５９９０１１２９６

【氏名又は名称】南亜塑膠工業股▲ふん▼有限公司

【住所又は居所】台湾台北市敦化北路２０１号

(19) [Publication Office] Japanese Patent Office (JP)

(12) [Kind of Document] Japan Unexamined Patent Publication (A)

(11) [Publication Number of Unexamined Application] Japan Unexamined Patent Publication 2000 - 211008(P2000 - 211008A)

(43) [Publication Date of Unexamined Application] 2000 August 2 day (2000.8.2)

(54) [Title of Invention] IS ACQUIRED WITH THREE LAYERS COEXTRUSION SYSTEM MANUFACTURING METHOD OF THICKNESS 25 TO 250 MICRON BIAXIALLY DRAWN POLYPROPYLENE (B OPP) PEARL GLOSS SYNTHETIC PAPER WHICH

(51) [International Patent Classification 7th Edition] B29C 47/06 47/88 55/12 71/04 B32B 5/18 27/10 27/32 // B29K 23:00 105:04 105:16 B29L 7:00 9:00

[FI] B29C 47/06 47/88 Z 55/12 71/04 B32B 5/18 27/10 27/32 Z

[Request for Examination] Examination not requested

[Number of Claims] 1

[Form of Application] OL

[Number of Pages in Document] 7

(21) [Application Number] Japan Patent Application Hei 11 - 15365

(22) [Application Date] 1999 January 25 day (1999.1.25)

(71) [Applicant]

[Applicant Code] 599011296

[Name] SOUTH SUB- 塑 GLUE INDUSTRY CROTCH .solid triangle. PPINGS .solid inv triangle. FINITE KOJI

[Address] Taiwan Taipei City Atsushi conversion north road 20

(72)【発明者】

【氏名】林豊欽

【住所又は居所】台湾台北市敦化北路２０１号

(74)【代理人】

【識別番号】１００００６５７７６

【弁理士】

【氏名又は名称】志村　正和

【テーマコード（参考）】4F0734F1004F2074F210

【Ｆターム（参考）】4F073 AA01 BA07 BA08 BA44 BA45 BA46 BA52 BB01 CA21 GA01 GA05 HA05 4F100 AA08A AA08B AA21A AA21B AK04B AK07A AK07B AL05B BA03 BA06 BA07 BA10A BA10B BA25 CA07B CA13A CA13B CA17B CA22A CA22B CA23A DE01A DE01B DJ01 EH202 EJ383 EJ413 EJ553 GB15 JA11A JA20A JK01 JN22 JN30 YY00 4F207 AA04 AA11 AB06 AB09 AB14 AB16 AB20 AC04 AF05 AF14 AG01 AG03 AH53 KA01 KA11 KA17 KB22 KK13 KK52 KL58 KL84 KW41 4F210 AA04 AA11 AB06 AB09 AB14 AB16 AB20 AC04 AF05 AF14 AG01 AG03 AH53 QC06 QD10 QD

(57)【要約】

【課題】従来の製造方法では、紙状層の印刷性を高めるため添加されている無機微細粉末は印刷加工工程において脱落するため、印刷機器を清掃する必要がある。また、一軸延伸で得られた紙状層と二軸延伸で得られた基材層とは総延伸率が異なり、このため加熱時に、紙状層と基材層の収縮率も異なり、合成紙がウェーブ状に変形してしまう。本発明ではこれらの問題を解消する。

【解決手段】　本発明は三層共押出方法により、それぞれ１台のフィーダーを持つトゥイン・スクリュー主押出機と２台のフィーダーを持つトゥイン・スクリュー副押出機から押出されたポリプロピレン樹脂と無機物の混合押出物を合流させ、１つのＴダイヘッドを経て紙状層または樹脂層／発泡中間層／紙状層または樹脂層の三層シートとし、さらに冷却成形、二軸延伸、コロナ処理、巻取りなどのステップを行う。

I number

(72) [Inventor]

[Name] Hayashi Yutaka 欽

[Address] Taiwan Taipei City Atsushi conversion north road 201 number

(74) [Attorney(s) Representing All Applicants]

[Applicant Code] 100065776

[Patent Attorney]

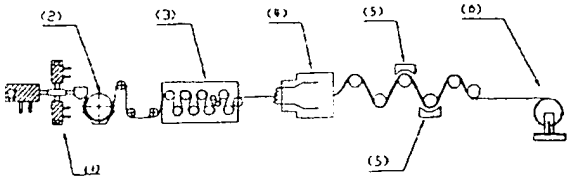
[Name] SHIMURA　MASAKAZU

[Theme Code (Reference)] 4F0734F1004F2074F210

(57) [Abstract]

[Problem] With conventional manufacturing method, in order to raise printing of paper layer, as for theinorganic finely divided powder which is added in order flaking to do in printing process,it is necessary purging to do printing press. In addition, entire draw ratio differs from paper layer which is acquiredwith uniaxial drawing and substrate layer which is acquired with biaxial drawing, becauseof this when heating, also shrinkage ratio of paper layer and substrate layerdiffers, synthetic paper deforms in wave condition. With this invention these problem are cancelled.

[Means of Solution] This invention in three layers coextrusion method to depend, Respectively, confluence doing mixed extruded product of polypropylene resin and theinorganic substance which extrusion are done from jp7 う yne * screw main extruder which has thefeeder of 1 and jp7 う yne * screw secondary extruder which hasthe feeder of 2, passing by T-die head of one, it makesthe paper layer or resin layer / foaming intermediate layer / paper layer or three-layer sheet of resin layer,furthermore does cooling formation, biaxial stretching,



【特許請求の範囲】

【請求項１】三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレン（ＢＯＰＰ）パール光沢合成紙の製造方法において、アイソタクチック度９７％以上の高結晶性ポリプロピレン（ＭＦＩ：０．５～８）３９～９５重量％及び炭酸カルシウム粉末０～４０重量％、二酸化チタン０～２０重量％、静電気防止剤１～５重量％から成るポリプロピレン樹脂混合物と、ポリプロピレン２２～９９．５重量％、ポリエチレン樹脂０～１２重量％、二酸化チタン粉末０～２０重量％、該炭酸カルシウム粉末０～４０重量％、該静電気防止剤０～３重量％、粘着防止剤０．５～３重量％、紫外線吸収剤０～２重量％から成る樹脂混合物を、それぞれサイドフィーダーを持つトゥイン・スクリュー主押出機１台と該サイドフィーダーを持つトゥイン・スクリュー副押出機２台のホッパーとフィーダーからそれぞれ入れ、押出機の温度を１８０～２８０℃に設定し、合流後にＴダイヘッドから押出し、パール光沢合成紙シートとし、１５～６０℃の冷却ロールで冷却、成形し、その後二軸延伸する紙シートを、１５０～１５０℃に加熱した後、延伸、アニーリングして縦方向に３～６倍延伸を行い、さらに１４０～１９５℃に加熱し、延伸、該アニーリングして横方向に５～１２倍延伸を行い、次に２０～１２０ＫＷ効率の高周波コロナ処理を行い、巻取装置で巻き取り、厚み２５～２５０ミクロンの紙状層／発泡中間層／該紙状層、該紙状層／該発泡中間層／樹脂層、該樹脂層／該発泡中間層／該樹脂層の３種類の三層共押出ポリプロピレンパール光沢合成紙とし、塗布用合成紙の塗布紙とすることを特徴とする、三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙の製造方法。

【発明の詳細な説明】

【０００１】

corona treatment and the winding or other step.

[Claim(s)]

[Claim 1] In manufacturing method of thickness 25 to 250 micron biaxially drawn polypropylene (B OPP) pearl gloss synthetic paper which is acquired with three layers coextrusion system putting, high crystallinity polypropylene (MFI:0.5 to 8)39 to 95 weight % and calcium carbonate powder 0 to 40 weight % of degree of isotactic 97 % or higher, titanium dioxide 0 to 20 weight %, Consists of antistatic agent 1 to 5 weight % polypropylene resin blend which, polypropylene 22 to 99.5 weight %, polyethylene resin 0 to 1 2 wt%, titanium dioxide powder 0 to 20 weight %, said calcium carbonate powder 0 to 40 weight %, said antistatic agent 0 to 3 wt%, antitackiness agent 0.5 to 3 wt%, Consists of ultraviolet absorber 0 to 2 wt% resin blend which, From jp7 う yne * screw main extruder 1 and hopper and feeder which of jp7 う yne * screw secondary extruder 2 which has said side feeder respectively have theside feeder each one to insert, temperature of extruder is set to 180 to 280 °C, After confluence from T-die head extrusion, pearl gloss synthetic paper sheet to do, With cooling roll of 15 to 60 °C cooling, It forms, after that biaxial stretching is done paper sheet which, It heated to 150 to 150 °C rear, drawing, annealing, in machine direction 3 to 6-fold drawing to do, Furthermore it heats to 140 to 195 °C, drawing and said annealing, manufacturing method of thickness 25 to 250 micron biaxially drawn polypropylene pearl gloss synthetic paper where itdoes 5 to 1 2 times drawing in horizontal direction, next does high frequency corona treatment of 20 to 120 KW efficiency,the paper layer / foaming intermediate layer / said paper layer of windup and thickness 25 to 250 micron, said paper layer / said foamingintermediate layer / resin layer, makes three layers coextrusion polypropylene pearl gloss synthetic paper of 3 kinds of said resin layer / said foaming intermediate layer / said resin layer withthe reel, designates that it makes application paper of synthetic paperfor application as feature, is acquired with three layers coextrusion system

[Description of the Invention]

[0001]

【発明の属する技術分野】本発明は三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙の製造方法に関するもので、とくに三層共押出方法により、それぞれフィーダーを持つトゥイン・スクリュー主押出機１台とフィーダーを持つトゥイン・スクリュー副押出機２台から押出されたポリプロピレン樹脂と無機物の混合押出物を合流させ、１つのＴダイヘッドを経て紙状層または樹脂層／発泡中間層／紙状層または樹脂層の三層シートとし、さらに冷却成形、二軸延伸、コロナ処理、巻取りなどのステップを経て、２５～２５０ミクロンの厚みを持つ紙状層／発泡中間層／紙状層の三層共押出両面紙状面パール光沢合成紙、紙状層／発泡中間層／樹脂層の三層共押出単面紙状面パール光沢合成紙、樹脂層／発泡中間層／樹脂層の三層共押出両面光沢面パール光沢合成紙を製造し、塗布用合成紙の塗布紙とするものを指す。

[Technological Field of Invention] As for this invention somet hing regarding manufacturing method of thickness 25 to 250 micron biaxially drawn polypropylene pearl gloss synthetic paper which isacquired with three layers coextrusion system being, In especially three layers coextrusion method to depend, From jp7う yne * screw main extruder 1 which respectively has feeder and jp7う yne * screw secondary extruder 2 which has feeder extrusion mixed extruded productof polypropylene resin and inorganic substance which are done confluence doing, Passing by T-die head of one, paper layer or resin layer / foaming intermediate layer / paper layer orthe three-layer sheet of resin layer to do, Furthermore passing by cooling formation, biaxial stretching , corona treatment and the winding or other step , three layers coextrusion both sides paper surface pearl gloss synthetic paper of paper layer / foaming intermediate layer / paper layer which hasthe thickness of 25 to 250 micron, three layers coextrusion pedion paper surface pearl gloss synthetic paper of the paper layer / foaming intermediate layer / resin layer, it produces three layers coextrusion both sides glossy surface pearl gloss synthetic paper of resin layer / foaming intermediate layer / resin layer,it points to those which are made application paper of synthetic paperfor application.

【０００２】

【従来の技術】現在ポリオレフィン合成紙は天然パルプ抄造紙に取って代わろうとしている。ポリプロピレンの二軸延伸フィルムを基材層（中間層）とし、裏表に８～６５重量%の無機微細粉末を含むポリプロピレン１軸延伸フィルムを紙状層とする合成紙が出願され、実用化されている。王子油化合成紙株式会社は特公昭４６－４０７９４号、特開昭５６－１４１３３９号、特開昭５６－１１８４３７号、特開平３－８７２５５号などの特許出願を提出している。

[0002]

[Prior Art] Presently polyolefin synthesis paper generation わ h as made wax for natural pulp wetlayed paper. biaxially drawn film of polypropylene is designated as substrate layer (intermediate layer), synthetic paper whichdesignates polypropylene uniaxially drawn film which includes inorganic finely divided powder of 8 to 65 weight % in the back surface as paper layer is applied, is utilized. Oji Yuka Synthetic Paper Co. Ltd. (DB 69-066-5880) Japan Examined Patent Publication Sho 46 - 40794 number, Japan Unexamined Patent Publication Showa 56 - 141339 number and Japan Unexamined Patent Publication Showa 56 - 118437 number, hassubmitted Japan Unexamined Patent Publication Hei 3 - 87255 number or other patent application.

【０００４】

【発明が解決しようとする課題】これらの製造方法では、基材層を縦方向延伸装置と横方向延伸装置の間に置き、２台の押出機を利用し、上下フィルムを作り紙状層を完成している。紙状層は横方向にだけ延伸でき、紙状層の強度は低い。紙状層の印刷性を高めるため添加されている無機微細粉末は印刷加工工程において脱落するため、印刷機器を清掃する必要がある。また、一軸延伸で得られた紙状層と二軸延伸で得られた基材層とは総延伸率が異なり、このため加熱時に、紙状層と基材層の収縮率も異なり、紙がウェーブ状に変形してしまう。さらに製造工程と製品品質の安定性を高めるため、２台の押出機で上下フィルムを完成する紙状層の製造工程では生産速

[0004]

[Problems to be Solved by the Invention] With these manufactu ring method, substrate layer is put between machine direction drawing equipment and transverse direction drawing equipment, making use of extruder of 2, top and bottom film is made and paper layeris completed. paper layer drawing is possible in just transverse direction, strength of the paper layer is low. In order to raise printing of paper layer, as for inorganic finely divided powder which isadded in order flaking to do in printing process, it is necessarythe cleaning to do printing press. In addition, entire draw ratio differs from paper layer which is acquiredwith uniaxial drawing and substrate layer which is acquired with biaxial stretching, becauseof this when heating, also shrinkage ratio of

度が制限され、延伸後の完成品の幅が最大６メートルにすぎない。単一の紙状層の厚みが少なくとも１０ミクロン（通常は３０ミクロン）必要なため、製品の厚みはつねに６０ミクロン以上となる。さもなくば、製品の厚みが不均一となり、印刷加工に影響が出てしまう。総体的に製造工程の難度が高く、生産コストも高いため、製品が普及しにくく、応用がむずかしい。

paper layer and substrate layerdiffers, paper deforms in wave condition. Furthermore in order to raise stability of production step and product quality,with production step of paper layer which completes top and bottom film with extruderof 2 manufacturing speed is restricted, width of completed product after the drawing is no more than a maximum 6 meter. Because thickness of single paper layer at least 10 micron (usually 30 micron) it is necessary,the thickness of product is above 60 micron always. Without, thickness of product becomes nonuniform, influence appearsin printing processing. difficulty of production step is high entire article, because also manufacturing cost is high,the product is difficult to spread, application is difficult.

【００05】

[0005]

【課題を解決するための手段】上記問題を解決するため、本発明出願人は新しい三層構造合成紙の製造方法を提出する。当該合成紙は紙状層または樹脂層／発泡中間層／紙状層または樹脂層から構成され、発泡中間層のポリプロピレン樹脂混合物を１台のフィーダーを持つトゥイン・スクリュー主押出機から、紙状層または樹脂層の樹脂混合物を２台のフィーダーを持つトゥイン・スクリュー副押出機からそれぞれ押出し、これらの押出物を合流させ、１つのＴダイヘッドを経て三層シートとし、さらに冷却成形、二軸延伸、コロナ処理、巻取りなどのステップを経て、２５～２５０ミクロンの厚みを持つ三層共押出単／両面紙状面および両面光沢面のパール光沢合成紙を得る。本発明の製造方法は三層共押出方式を採用する。各層の押出物を合流させた後に共押出し、さらに二軸圧延して得られた合成紙は、従来の方法により二軸延伸した中間層に一軸延伸した紙状面を貼付して得られた合成紙とは構造、製造方法とも異なる。同時に副押出機から押出す原料を、無機充填剤を使用した紙状層と無機充填剤を添加していない樹脂層から選ぶことで、紙状層／発泡中間層／紙状層の三層共押出両面紙状面パール光沢合成紙、紙状層／発泡中間層／樹脂層の三層共押出単面紙状面パール光沢合成紙、樹脂層／発泡中間層／樹脂層の三層共押出両面光沢面パール光沢合成紙を製造し、塗布用合成紙の塗布紙とすることができる。

[Means to Solve the Problems] In order to solve above-mention ed problem, this invention applicant submits themanufacturing method of new trilayer structure synthetic paper. this said synthetic paper is formed from paper layer or resin layer / foaming intermediate layer / paper layer or resin layer, polypropylene resin blend of foaming intermediate layer has feeder of 1 fromthe jp7 う yne * screw main extruder which, Respective extrusion , confluence doing these extruded product from jp7 う yne * screw secondary extruder which has feeder of 2, passing by theT-die head of one, it designates resin blend of paper layer or resin layeras three-layer sheet, furthermore passes by cooling formation, biaxial stretching , the corona treatment and winding or other step , it obtains three layers coextrusion single / both sides paper aspect and thepearl gloss synthetic paper of both sides glossy surface which have thickness of 25 to 250 micron. manufacturing method of this invention adopts three layers coextrusion system coextrusion , furthermore biaxial rolling doing extruded product of each layer afterthe confluence , synthetic paper which it acquires, sticking paper aspectwhich uniaxial drawing is done in intermediate layer which biaxial stretching is done with the conventional method , synthetic paper which it acquires differs with structure and the manufacturing method. starting material which is pushed out from secondary extruder simultaneously,by fact that it chooses from resin layer which does not add thepaper layer and inorganic filler which use inorganic filler, three layers coextrusion both sides paper surface pearl gloss synthetic paper ofthe paper layer / foaming intermediate layer / paper layer, three layers coextrusion pedion paper surface pearl gloss synthetic paper of the paper layer / foaming intermediate layer / resin layer, it produces three layers coextrusion both sides glossy surface pearl gloss synthetic paper of resin layer / foaming intermediate layer / resin layer,can make application paper of synthetic paper for application.

【０００６】

[0006]

【発明の実施の形態】本発明の技術内容を明確に示すため、ポリプロピレン樹脂混合物と製造工程（押出し、三層共押出、冷却、二軸延伸、コロナ処理、巻取り）について以下に説明する。本発明の二軸延伸ポリプロピレンパール光沢合成紙は三層構造を有する。その発泡中間層は１台のサイドフィーダーを持つトゥイン・スクリュー主押出機で押出す。アイソタクチック度９７％以上の高結晶性ポリプロピレン３９～９５重量％、静電気防止剤１～５重量％を主押出機の前方にあるホッパーで均一に撹拌し、主押出機に入れる。さらに炭酸カルシウム粉末０～４０重量％と二酸化チタン粉末０～２０重量％を計量後、１台または２台のサイドフィーダーで主押出機に入れる。主押出機のトゥイン・スクリューで均一に混練した後、樹脂と無機粉末の混合物をＴダイヘッドの中間ラナー（runner）に押し入れる。また、紙状層はサイドフィーダーを持つトゥイン・スクリュー主押出機２台で押出す。ポリプロピレン２０～９９．５重量％、ポリエチレン０～１２重量％、静電気防止剤０～３重量％、粘着防止剤０．５～３重量％、紫外線吸収剤０～２重量％を副押出機前方にあるホッパーで均一に撹拌した後、副押出機に入れる。さらに炭酸カルシウム粉末０～４０重量％と二酸化チタン粉末０～２０重量％を計量後、１台または２台のサイドフィーダーで副押出機に入れる。副押出機のトゥイン・スクリューで均一に混練した後、樹脂と無機粉末の混合物をＴダイヘッドの両側道に押し入れる。上述の押出機３台からの押出物を合流させ、Ｔダイヘッドで共押出し、樹脂層または紙状層／発泡中間層／樹脂層または紙状層のシートを形成する。二軸延伸、コロナ処理、巻取のステップを経て、厚み２０～２５０ミクロンの両／単面紙状面のパール光沢合成紙を製造する。本発明の製造方法で製造された合成紙は文化紙に適しており、高結晶性ポリプロピレンを主要原料としている。本発明で使用されるポリプロピレン樹脂は溶融指数（ＭＦＩ）が０．５～８（２３０℃／２．１６ｋｇ ＡＳＴＭ Ｄ１２３８）で、大部分がアイソタクチックな均一重合物とする。この種の高分子構造は分子同士が配列正しく結合している。原料の分子量とその分布状況により、パール光沢合成紙の機械強度と品質の均一性を制御することができる。本発明の製造方法で得られたパール光沢合成紙は三層構造を呈している。図１に示す通り、紙状層の紙模倣効果を高めるため、ポリエチレン、無機粉末を配合し、その用量で光沢度、筆記性、印刷性を調整することができる。ポリエチレンのＭＦＩは０．１～７のものを採用する。ポリエチレンのＭＦＩで紙状面の強度を調整できる。本発明で使用される無機粉末は、発泡中間層の密度を下げる（延伸工程における微細孔発生を利用）ほか、紙状層にプラスチック紙とは異なる優れた筆記性と印刷性をもたらすことができる。無機粉末は炭酸カルシウム、けい藻土、クレー、酸化カルシウム、硫酸バリウム、二酸化チタンなどのグループから１種類または多種類を選んで使用する。その粒径は０．１～１０ミクロンとし、用量は製品の需要によって決定する。本発明は側方から配合料を給送するトゥイン・スクリュー

[Embodiment of Invention] In order to show technology content of this invention clearly, you explain belowconcerning polypropylene resin blend and production step (extrusion , three layers coextrusion , cooling, biaxial stretching , corona treatment and winding). biaxially drawn polypropylene pearl gloss synthetic paper of this invention has trilayer structure. It pushes out foaming intermediate layer with jp7 う yne * screw main extruder which has theside feeder of 1. high crystallinity polypropylene 39 to 95 weight % of degree of isotactic 97 % or higher, with hopper which is in theforward direction of main extruder it agitates antistatic agent 1 to 5 weight % to uniform, inserts in the main extruder. Furthermore calcium carbonate powder 0 to 40 weight % and titanium dioxide powder 0 to 20 weight % after weighing, are inserted inthe main extruder with side feeder of 1 or 2. After with jp7 う yne * screw of main extruder kneading in uniform, theblend of resin and inorganic powder is forced in intermediate runner (runner) ofthe T-die head. In addition, it pushes out paper layer with jp7 う yne * screw main extruder 2 which hasthe side feeder. polypropylene 20 to 99.5 weight % , polyethylene 0 to 1 2 wt% , antistatic agent 0 to 3 wt% , antitackiness agent 0.5 to 3 wt% and ultraviolet absorber 0 to 2 wt% after withthe hopper which is in secondary extruder forward direction agitating to uniform, areinserted in secondary extruder. Furthermore calcium carbonate powder 0 to 40 weight % and titanium dioxide powder 0 to 20 weight % after weighing, are inserted inthe secondary extruder with side feeder of 1 or 2. After with jp7 う yne * screw of secondary extruder kneading in theuniform, blend of resin and inorganic powder is forced in both sidesroad of T-die head. confluence doing extruded product from above-mentioned extruder 3 platform, coextrusion ,it forms resin layer or paper layer / foaming intermediate layer / resin layer or sheet of paper layerwith T-die head. Passing by step of biaxial stretching , corona treatment and winding, both ofthe thickness 20 to 250 micron / it produces pearl gloss synthetic paper of pedion paper aspect. synthetic paper which is produced with manufacturing method of this invention is suitablefor cultural paper, high crystallinity polypropylene as principal starting material designates. As for polypropylene resin which is used with this invention melt index (MFI) being the0.5 to 8(230 °C /2.16 kg ASTM D1238), major portion makes isotactic uniform polymer. As for polymer structure of this kind molecule has connected arrangementcorrectly. With molecular weight and distribution state of starting material, mechanical strength of pearl gloss synthetic paper andthe uniformity of quality can be controlled. pearl gloss synthetic paper which is acquired with manufacturing method of this invention has displayedthe trilayer structure. As shown in Figure 1, in order to raise paper-imitation effect of the paper layer, polyethylene and inorganic powder can be combined, gloss , writing property and printing can be adjusted with dose. MFI of polyethylene adopts those of 0.1 to 7. strength of paper aspect can be adjusted with MFI of the polyethylene. It is

押出機で製造する。その無機粉末はサイドフィーダーから押出機に入れる。トゥイン・スクリューを利用した押出機で均一に混練することができる。このほか、無機粉末と樹脂を先に混練した複合粒を最前方のホッパーに入れ、各種樹脂と混合した後さらに押出機に入れることもできる。本発明では製品の不透明度、白色度、抗紫外線性を調整するため、二酸化チタン粉末を使用している。本発明の静電気防止剤は、通常の二軸延伸ポリプロピレン（ＢＯＰＰ）で使用されている静電気防止剤をすべて使用することができる。三級アミン類が主に使用されている。三級アミンは電荷移行性を有するため、加工摩擦で発生した静電気を除去することができる。本発明において、合成紙を巻き取る時互いに粘着するため、粘着防止剤を添加する必要がある。通常の二軸延伸ポリプロピレンで使用されているシリカ、クレー、ポリメチルアクリル酸メチルエステル（ＰＭＭＡ）、ガラスビーズなどから１種類を選ぶことができる。本発明で得られるポリプロピレンパール光沢合成紙の比重は０．７５以下であり、混合物の組成比で調整することができる。これは特開平３－８７２５５号の合成紙の０．７９に比べて低く、同じ重さでより広い面積の合成紙を製造することができるため、経済性が高い。本発明で得られる二軸延伸ポリプロピレンパール光沢合成紙は、紙状層／発泡中間層／紙状層または樹脂層の三層構造を有し、物性、生産能力は材料の配合、設備、操作と深い関係がある。通常のポリプロピレン膜の二軸延伸製品は、ほとんどが充填剤を添加していない、透明な製品である。本発明では紙を模倣するため、製造工程において大量の無機充填剤を添加する必要があり、二軸延伸製造工程の生産性、生産能力、品質安定に関して問題を克服しなければならない。本発明のポリプロピレンパール光沢合成紙（厚み２５～２５０ミクロン）で使用する製造工程の装置とステップを図４に示す。

押出機装置（図４の(1)）：サイドフィーダーを持つトゥイン・スクリュー主押出機１台とサイドフィーダーを持

possible to bring writing property and printing where inorganic powder whichis used with this invention, (micropore occurrence in stretching process utilization) other things which lower density ofthe foaming intermediate layer, differs from plastic paper in paper layer and issuperior. Choosing 1 kind or multiple kinds from calcium carbonate , diatomaceous earth , clay ,the calcium oxide , barium sulfate and titanium dioxide or other group, you use inorganic powder. particle diameter makes 0.1 to 10 micron, decides dose with demand of theproduct. It produces this invention with jp7 う yne * screw extruder which sends compounded material from side direction. From side feeder you insert inorganic powder in extruder. It is possible with extruder which utilizes jp7 う yne * screw toknead in uniform In addition, you insert compound grain which kneaded inorganic powder andthe resin first in hopper of forwardmost, after mixing with various resin, furthermore you can also insert in extruder. In order with this invention opacity of product, to adjust degree of whiteness and anti ultraviolet light characteristic, titanium dioxide powder is used. antistatic agent of this invention can use antistatic agent which is used with conventional biaxially drawn polypropylene (B OPP)entirely. tertiary amines is used mainly. tertiary amine in order to possess electric charge transfer characteristic, can remove thestatic electricity which occurs in processing friction. Regarding to this invention, when retracting synthetic paper, in order mutuallythe sticking to do, it is necessary to add antitackiness agent. It is possible to choose 1 kind from silica , clay , the poly methyl methyl acrylate ester (PMMA) and glass beads etc which are used with conventional biaxially drawn polypropylene. density of polypropylene pearl gloss synthetic paper which is acquired with this invention is 0.7 5 or less,you can adjust with composition ratio of blend. This is low in comparison with 0.79 of synthetic paper of Japan Unexamined Patent Publication Hei 3- 87255number, because synthetic paper of a wider surface area can be produced with thesame weight, economy is high. biaxially drawn polypropylene pearl gloss synthetic paper which is acquired with this invention has paper layer / foaming intermediate layer / paper layeror trilayer structure of resin layer, property and production capability combination, the facility and operation of material is a deep relationship. As for biaxial stretching product of conventional polypropylene film, majority has not added filler,it is a transparent product. In order with this invention imitation to do paper, and it is necessaryto add inorganic filler of large scale in production step it must overcome problemthe productivity of biaxial stretching production step, in regard to production capability and quality stability. equipment and step of production step which is used with polypropylene pearl gloss synthetic paper (thickness 25 to 250 micron) ofthe this invention are shown in Figure 4.

It consists of jp7 う yne * screw main extruder 1 which has extruder equipment (Figure 4 (1)): side feeder and thejp7 う yne *

つトゥイン・スクリュー副押出機２台から成る。その温度設定条件は樹脂混合物の組成、ＭＦＩ、結晶度、粘度、生産ラインの速度、製品の厚みによって異なるが、通常は１８０～２８０℃とする。１８０℃以下では樹脂の可塑化が進まず、Ｔダイヘッドで押出すことができない。２８０℃以上では樹脂が過度に可塑化し、亀裂が入ってしまう。本発明では三層共押出方式で三層合成紙（紙状層または樹脂層／発泡中間層／紙状層または樹脂層）を製造する。Ｔダイヘッドの流道設計により三層の押出物を合流させ、Ｔダイヘッドで三層を共押出する。

screw secondary extruder 2 which has side feeder. temperature setting condition differs composition of resin blend, velocity of MFI, the degree of crystallinity, viscosity and manufacturing line, depending upon thickness of product,but it makes 180 to 280 °C usually. With 180 °C or below plasticization of resin does not advance, it is notpossible to push out with T-die head. With 280 °C or higher resin plasticizes excessively, crack enters. With this invention three layers synthetic paper (paper layer or resin layer / foaming intermediate layer / paper layer or resin layer) is produced with three layers coextrusion system confluence doing extruded product of three layers with style road design ofthe T-die head, coextrusion it does three layers with T-die head.

冷却成形ロール装置（図４の(2)）：水冷式またはガス冷却式の冷却装置とする。１８０～２８０℃で三層共押出された溶融共押出物を冷却し、成形する。冷却温度の制御は、その後のステップが順調にいくかどうかを大きく左右する。冷却温度は通常１５～６０℃に設定し、合成紙板の厚みと生産ラインの速度によりこの範囲で調整できる。

It makes cooling forming roll equipment (Figure 4 (2)): water cooled or cooling apparatus of gas cooling type. It cools dissolving coextruded product which three layers coextrusion is done with 180 to 280 °C,forms. It influences control of cooling temperature, largely whether or not after that step goes favorably. It can set cooling temperature to 15 to 60 °C usually, it can adjust in this rangewith thickness of synthetic paper sheet and velocity of manufacturing line.

縦方向延伸装置（図４の(3)）：冷却成形を経た紙板を縦方向延伸装置に入れる。先ず１１５～１５０℃（紙板の厚みと生産ラインの速度で選択する）に加熱し、紙板を軟化させ、さらに低速および高速の２段階で延伸し、合成紙に縦方向強度を与える。また、アニーリングで成形する。縦方向の延伸率は通常３～６倍に設定する。

Longitudinal direction drawing equipment (Figure 4 (3)): paper sheet which passes cooling formation is inserted inthe longitudinal direction drawing equipment. First heating to 115 to 150 °C (It selects with thickness of paper sheet and rate of manufacturing line.), paper sheet softening, furthermoredrawing with 2-stage of low speed and high speed, it gives longitudinal direction strengthto synthetic paper. In addition, it forms with annealing. It sets draw ratio of longitudinal direction to 3 to 6-fold usually.

横方向延伸装置（図４の(4)）：縦方向延伸処理で薄くなった紙板を１４０～１９５℃（紙板の厚みと生産ラインの速度で選択する）に加熱して軟化させ、横方向に延伸し、さらにアニーリングで成形し、パール合成紙の部分収縮によりサイズの安定性を高める。通常、横方向延伸倍率は５～１２倍に設定する。製品の特性により選ぶことができる。

Heating paper sheet which becomes thin with transverse directio n drawing equipment (Figure 4 (4)): machine direction drawing to the140 to 195 °C (It selects with thickness of paper sheet and rate of manufacturing line.), softening, drawing in transverse direction, furthermore it forms withannealing, it raises stability of size with portion contractionof pearl synthetic paper. usually, it sets transverse direction draw ratio to 5 to 1 2 times. It is possible to choose with characteristic of product.

コロナ処理装置（図４の(5)）：コロナ処理はポリプロピレンパール光沢合成紙の物性を改善するために行われ、印刷、塗布、コーティングなどの加工が容易になる。処理効率を２０～１２０ＫＷとする高周波放電装置（生産ラインの速度により調整）でコロナ処理を行う。これにより表面の湿潤張力は３６～４８ダイン／ｃｍに達する。

Corona treatment equipment (Figure 4 (5)): corona treatment is done in order to improve property of polypropylene pearl gloss synthetic paper,printing, application and coating or other processing become easy. corona treatment is done with high frequency discharge equipment (In velocity of manufacturing line depending adjustment) which designates treatment efficiency as the20 to 120 KW. Because of this wetting tension of surface reaches to 36 to 48 dyne/cm

巻取装置（図４の(6)）：鉄パイプを利用し、完成したパ

Making use of reel (Figure 4 (6)): iron pipe, pearl gloss synthet

ール光沢合成紙を巻き取り、幅８メートルの完成品とする。必要により縦または横にカットし、包装して、厚み２５～２５０ミクロンのロール状またはシート状製品とする。本発明の製造方法で得られた厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙における三層の厚みを表１に示す。紙状層と樹脂層の厚みは１～３０ミクロンの範囲で調整できる。

ic paper which is completed isdesignated as completed product of windup and width 8 meter. It cuts off vertically or side in accordance with necessary, packs,mnkes roll or sheet product of thickness 25 to 250 micron. thickness of three layers in thickness 25 to 250 micron biaxially drawn polypropylene pearl gloss synthetic paper which is acquired with manufacturing methodof this invention is shown in Table 1. You can adjust thickness of paper layer and resin layer in range of the1 to 30 micron.

【０００７】本発明の技術内容を明確に説明するため、以下に筆記用、印刷用、包装用及び各種用途の合成紙を製造した本発明の実施例を示す。ただし、本発明の特許範囲はこれに限定されない。

[0007] In order to explain technology content of this inventio n clearly, Working Example of thethis invention which produces synthetic paper for writing, printing, packing andvarious application below is shown. However, patent range of this invention is not limited in this.

［実施例１］厚み２５０ミクロン以下の単面紙状面パール光沢合成紙

[Working Example 1] Pedion paper surface pearl gloss syntheti c paper of thickness 250 micron or less

ポリプロピレン（ＭＦＩ：２．４）６７重量％、静電気防止剤３重量％を混合した後、ホッパーからサイドフィーダーを持つトゥイン・スクリュー主押出機に入れ、さらに炭酸カルシウム粉末２０重量％及び二酸化チタン１０重量％を計量後、それぞれフィーダーを持つトゥイン・スクリュー主押出機に入れる。また、ポリプロピレン（ＭＦＩ：５）６２重量％、ポリエチレン（ＭＦＩ：１）１２重量％、静電気防止剤２重量％、粘着防止剤３重量％、紫外線吸収剤１重量％をミキサーで混合した後、ホッパーからサイドフィーダーを持つトゥイン・スクリュー＃１副押出機に入れる。さらに炭酸カルシウム粉末１０重量％及び二酸化チタン１０重量％を計量後、それぞれ２つのフィーダーからトゥイン・スクリュー＃２副押出機に入れる。別に、ポリプロピレン（ＭＦＩ：２．４）９７重量％、粘着防止剤３重量％をミキサーで混合した後、ホッパーからサイドフィーダーを持つトゥイン・スクリュー＃２副押出機に入れる。押出機の温度を２００～２８０℃に設定し、三層共押出方式によりＴダイヘッドから押出す。１５～６０℃に設定された冷却ロールを経て、ポリプロピレンパール光沢合成紙板が冷却、成形される。成形された紙板は縦方向延伸装置に入れ、１２０～１５０℃に加熱した後、縦方向に５倍延伸を行う。延伸後はアニーリングを行う。冷却後に再び横方向延伸装置に入れ、１５０～１８５℃に加熱し、再び横方向に９倍延伸を行う。延伸後はアニーリングを行い、合成紙の収縮率を制御する。横方向延伸装置を出た後、コロナ処理装置に入れ、合成紙の印刷性を向上し、最後に巻取装置で巻き取る。上記の方法で得られた厚み２５０ミクロン以下の単面紙状面パール光沢合成紙は、筆記、印刷、包装およびその他の用途に汎用することができる。本実施例で選られた厚み６０ミクロン、１００ミクロン、１２０ミクロンの単面紙状面パール光沢合成紙の物性を表２に示す。

After mixing polypropylene (MFI:2.4)67 weight% and antista tic agent 3 wt%, you insert in jp7 う yne * screw main extruderwhich has side feeder from hopper, furthermore after weighing, youinsert calcium carbonate powder 20 weight% and titanium dioxide 10 weight% in jp7 う yne * screw main extruder whichrespectively has feeder. In addition, after mixing polypropylene (MFI:5)6 2 wt%, polyethylene (MFI:1)1 2 wt%, antistatic agent 2 wt%, antitackiness agent 3 wt% and ultraviolet absorber 1 wt% with mixer, you insert in jp7 う yne * screw #1secondary extruder which has side feeder from hopper. Furthermore calcium carbonate powder 10 weight% and titanium dioxide 10 weight% after weighing, from therespective 2 feeder are inserted in jp7 う yne * screw #2 secondary extruder. Separately, after mixing polypropylene (MFI:2.4)97 weight% and antitackiness agent 3 wt% with mixer, youinsert in jp7 う yne * screw #2 secondary extruder which has side feeder fromthe hopper. It sets temperature of extruder to 200 to 280 °C, it pushes out from theT-die head with three layers coextrusion system. Passing by cooling roll which is set to 15 to 60 °C, polypropylene pearl gloss synthetic paper sheet is cooledand forms. You insert paper sheet which formed in machine direction drawing equipment, after heating to the120 to 150 °C, you do 5 times drawing in machine direction. After drawing it anneals. After cooling you insert in transverse direction drawing equipment again, heat to 150 to 185 °C, do the9 times drawing again in transverse direction. After drawing it anneals, controls shrinkage ratio of synthetic paper. After coming out of transverse direction drawing equipment, you insert in corona treatment equipment, printing ofthe synthetic paper improve, lastly with reel retract. In writing , printing, packing and other application it can widely usethe pedion paper surface pearl gloss synthetic paper of thickness 250 micron or less which is acquired with theabove-mentioned method. property of pedion paper surface pearl

［実施例２］厚み２５０ミクロン以下の両面紙状面パール光沢合成紙

ポリプロピレン（ＭＦＩ：２．４）６８重量%、静電気防止剤２重量%を混合した後、ホッパーからサイドフィーダーを持つトゥイン・スクリュー主押出機に入れ、さらに炭酸カルシウム粉末１５重量%及び二酸化チタン１５重量%を計量後、それぞれ２つのフィーダーからトゥイン・スクリュー主押出機に入れる。また、ポリプロピレン（ＭＦＩ：５）５８重量%、ポリエチレン（ＭＦＩ：１）１２重量%、静電気防止剤２重量%、粘着防止剤３重量%、紫外線吸収剤１重量%をミキサーで混合した後、ホッパーからそれぞれ＃１、＃２のサイドフィーダーを持つトゥイン・スクリュー副押出機２台に入れる。さらに炭酸カルシウム粉末１２重量%及び二酸化チタン１２重量%を計量後、それぞれ２つのサイドフィーダーから＃１、＃２トゥイン・スクリュー副押出機に入れる。押出機の温度を２００～２８０℃に設定し、三層共押出方式によりＴダイヘッドから押出す。２５～６０℃に設定された冷却ロールを経て、ポリプロピレンパール光沢合成紙板が冷却、成形される。成形された紙板は縦方向延伸装置に入れ、１２０～１５０℃に加熱した後、縦方向に４．５倍延伸を行う。延伸後はアニーリングを行う。冷却後に再び横方向延伸装置に入れ、１５５～１９０℃に加熱し、再び横方向に８．５倍延伸を行う。延伸後はアニーリングを行い、合成紙の収縮率を制御する。横方向延伸装置を出た後、コロナ処理装置に入れ、合成紙の印刷性を向上し、最後に巻取装置で巻き取る。上記の方法で得られた厚み２５０ミクロン以下の両面紙状面パール光沢合成紙は、筆記、印刷、包装およびその他の用途に汎用することができる。本実施例で選られた厚み６０ミクロン、１００ミクロン、１５０ミクロンの両面紙状面パール光沢合成紙の物性を表３に示す。

［実施例３］厚み２５０ミクロン以下の両面光沢面パール光沢合成紙

ポリプロピレン（ＭＦＩ：２．４）６２重量%、静電気防止剤３重量%を混合した後、ホッパーからサイドフィーダーを持つトゥイン・スクリュー主押出機に入れ、さらに炭酸カルシウム粉末２０重量%及び二酸化チタン１５重量%を計量後、それぞれ２つのフィーダーからトゥイン・スクリュー主押出機に入れる。また、ポリプロピレン（ＭＦＩ：３．０）９６重量%、静電気防止剤２重量%、粘着防止剤２重量%をミキサーで混合した後、そ

gloss synthetic paper of thickness 60 micron , 100 micron and 120 micron which are selected with this working example is shown in Table 2.

[Working Example 2] Both sides paper surface pearl gloss synthetic paper of thickness 250 micron or less

After mixing polypropylene (MFI:2.4)68 weight% and antistatic agent 2 wt%, you insert in jp7 う yne * screw main extruderwhich has side feeder from hopper, furthermore after weighing, fromthe respective 2 feeder insert calcium carbonate powder 15 weight% and titanium dioxide 15 weight% in jp7 う yne * screw main extruder. In addition, after mixing polypropylene (MFI:5)58 weight% , polyethylene (MFI:1)12 wt% , antistatic agent 2 wt% , antitackiness agent 3 wt% and ultraviolet absorber 1 wt% with mixer, respective #1, you insert in thejp7 う yne * screw secondary extruder 2 which has side feeder of #2 fromthe hopper. Furthermore calcium carbonate powder 12 wt% and titanium dioxide 12 wt% after weighing, from therespective 2 side feeder are inserted in #1 and #2 jp7 う yne * screwsecondary extruder. It sets temperature of extruder to 200 to 280 °C, it pushes out from theT-die head with three layers coextrusion system. Passing by cooling roll which is set to 25 to 60 °C, polypropylene pearl gloss synthetic paper sheet is cooledand forms. You insert paper sheet which formed in machine direction drawing equipment, after heating to the120 to 150 °C, you do 4. 5 times drawing in machine direction. After drawing it anneals. After cooling you insert in transverse direction drawing equipment again, heat to 155 to 190 °C, do the8. 5 times drawing again in transverse direction. After drawing it anneals, controls shrinkage ratio of synthetic paper. After coming out of transverse direction drawing equipment, you insert in corona treatment equipment, printing ofthe synthetic paper improve, lastly with reel retract. In writing , printing, packing and other application it can widely usethe both sides paper surface pearl gloss synthetic paper of thickness 250 micron or less which is acquired with theabove-mentioned method. property of both sides paper surface pearl gloss synthetic paper of thickness 60 micron , 100 micron and the150 micron which are selected with this working example is shown in Table 3.

[Working Example 3] Both sides glossy surface pearl gloss synthetic paper of thickness 250 micron or less

After mixing polypropylene (MFI:2.4)62 wt% and antistatic agent 3 wt%, you insert in jp7 う yne * screw main extruderwhich has side feeder from hopper, furthermore after weighing, fromthe respective 2 feeder insert calcium carbonate powder 20 weight% and titanium dioxide 15 weight% in jp7 う yne * screw main extruder. In addition, after mixing polypropylene (MFI:3.0) 96 wt% , antistatic agent 2 wt% and antitackiness agent 2 wt% with themixer, respective #1, you

れぞれ＃１、＃２のサイドフィーダーを持つトゥイン・スクリュー副押出機に入れる。押出機の温度を２００～２８０℃に設定し、三層共押出方式によりＴダイヘッドから押出す。１５～６０℃に設定された冷却ロールを経て、ポリプロピレンパール光沢合成紙板が冷却、成形される。成形された紙板は縦方向延伸装置に入れ、１２０～１５０℃に加熱した後、縦方向に５倍延伸を行う。延伸後はアニーリングを行う。冷却後に再び横方向延伸装置に入れ、１５０～１８５℃に加熱し、再び横方向に９倍延伸を行う。延伸後はアニーリングを行い、合成紙の収縮率を制御する。横方向延伸装置を出た後、コロナ処理装置に入れ、合成紙の印刷性を向上し、最後に巻取装置で巻き取る。上記の方法で得られた厚み２５０ミクロン以下の両面光沢面パール光沢合成紙は、筆記、印刷、包装およびその他の用途に汎用することができる。本実施例で選られた厚み７０ミクロン、１１０ミクロン、１４０ミクロンの両面光沢面パール光沢合成紙の物性を表４に示す。

insert in jp7 う yne * screw secondaryextruder which has side feeder of #2. It sets temperature of extruder to 200 to 280 °C, it pushes out from theT-die head with three layers coextrusion system. Passing by cooling roll which is set to 15 to 60 °C, polypropylene pearl gloss synthetic paper sheet is cooledand forms. You insert paper sheet which formed in machine direction drawing equipment, after heating to the120 to 150 °C, you do 5 times drawing in machine direction. After drawing it anneals. After cooling you insert in transverse direction drawing equipment again, heat to 150 to 185 °C, do the9 times drawing again in transverse direction. After drawing it anneals, controls shrinkage ratio of synthetic paper. After coming out of transverse direction drawing equipment, you insert in corona treatment equipment, printing ofthe synthetic paper improve, lastly with reel retract. In writing , printing, packing and other application it can widely usethe both sides glossy surface pearl gloss synthetic paper of thickness 250 micron or less which is acquired with above-mentionedmethod. property of both sides glossy surface pearl gloss synthetic paper of thickness 70 micron , 110 micron and 140 micron which areselected with this working example is shown in Table 4.

【０００８】

【発明の効果】本発明の製造方法で得られた合成紙は、紙状層を縦方向に延伸したが、横方向延伸していないフィルムを一軸延伸層とする従来の製品とは、製造工程、使用原料の配合に関して大きな差がある。これにより、天然紙に取って代わり用途を広げることができ、以下の長所を持つ。紙状層の原料はポリプロピレン、ポリエチレン、二酸化チタン、無機粉末を主成分とし、マッドな光沢を持ち、白色度と遮蔽度は従来の紙を上回る。二軸延伸の紙状層は優れた剛性を持ち、無機粉末の定着性も良好で、印刷過程において粉末が脱落することはない。紙状層及び樹脂層と発泡中間層は同じ延伸率を持ち、紙の収縮が均一となるため、加熱された面がウェーブ状に変形しにくい。また同じ延伸率を持つ紙状層と発泡中間層は剥離しにくい。紙状層及び樹脂層の厚みは１～３０ミクロンの範囲で副押出機からの押出量により制御することができる（製品の厚みは需要と用途により変化させることができる）。製造工程の生産速度が速く、最大３．５トン／時間に達する。最大幅は８メートルで、厚みも２５～２５０ミクロンと選択範囲が広い。紙状層、樹脂層及び発泡中間層は側面にフィーダーを持つトゥイン・スクリュー押出機から押出され、原料の混練が均一なため、製品の厚みを±２％以内に制御することができる。押出機は粉末状の無機粉末を側面のフィーダーに入れることができるため、無機粉末の複合粒（マスターバッチ）だけを使用する必要がなく、原料コストを大幅に削減できる。このほか、無機粉末の複合粒を単ねじ棒押出機で生産することもできる。ただし、押出機のねじ棒のＬ／Ｄ率（長さ／直径）を高めて、原料の混練を均一にする必要がある。生産コストが低く、市場競争力を有す

[0008]

[Effects of the Invention] Synthetic paper which is acquired wit h manufacturing method of this invention drew paper layerin machine direction, but transverse direction conventional product which designates film whichhas not been drawn as uniaxial drawing layer, there is a big difference in regardto combination of production step and used raw material. Because of this, it replaces in natural paper and it is possible, has thestrength below to expand application. starting material of paper layer designates polypropylene , polyethylene , titanium dioxide andthe inorganic powder as main component, degree of whiteness and degree of shielding exceed conventional paper the mud with gloss. As for paper layer of biaxial stretching also fixing property of inorganic powder beingsatisfactory with stiffness which is superior, powder are not timeswhen flaking it does in printing process. As for paper layer and resin layer and foaming intermediate layer becausecontraction of paper becomes uniform with same draw ratio, thesurface which is heated is difficult to become deformed in wavecondition. In addition paper layer and foaming intermediate layer which have same draw ratioare difficult to peel off. It can control thickness of paper layer and resin layer in range of the1 to 30 micron with extruded amount from secondary extruder (thickness of product changes with demand and application). manufacturing speed of production step is quick, reaches to maximum 3.5 ton/hr. maximum width with 8 meter, thickness 25 to 250 micron and selection limits is wide. paper layer , resin layer and foaming intermediate layer extrusion are done from thejp7 う yne * screw extruder which has feeder in side face, kneading of the starting material because

る。

of uniform, can control thickness of product withinthe +/- 2 %. As for extruder because it is possible, to insert inorganic powder of thepowder in feeder of side face, it is not necessary to use just thecompound grain (master batch) of inorganic powder, greatly can reduce raw material cost. In addition, it is possible also to produce compound grain of the inorganic powder with single threaded rod extruder. However, raising L/D ratio (length / diameter) of threaded rod of extruder, it isnecessary to designate kneading of starting material as uniform manufacturing cost is low, possesses market competitive strength.

【図面の簡単な説明】

[Brief Explanation of the Drawing(s)]

【図１】三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙の三層構造（紙状層／発泡中間層／紙状層）

[Figure 1] Trilayer structure of thickness 25 to 250 micron bia xially drawn polypropylene pearl gloss synthetic paper which is acquired with three layers coextrusion system (paper layer / foaming intermediate layer / paper layer)

【図２】三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙の三層構造（紙状層／発泡中間層／樹脂層）

[Figure 2] Trilayer structure of thickness 25 to 250 micron bia xially drawn polypropylene pearl gloss synthetic paper which is acquired with three layers coextrusion system (paper layer / foaming intermediate layer / resin layer)

【図３】三層共押出方式で得られる厚み２５～２５０ミクロン二軸延伸ポリプロピレンパール光沢合成紙の三層構造（樹脂層／発泡中間層／樹脂層）

[Figure 3] Trilayer structure of thickness 25 to 250 micron bia xially drawn polypropylene pearl gloss synthetic paper which is acquired with three layers coextrusion system (resin layer / foaming intermediate layer / resin layer)

【図４】本発明の製造装置説明図

[Figure 4] Production equipment explanatory diagram of this in vention

押出機装置

Extruder equipment

冷却成形ロール装置

Cooling forming roll equipment

縦方向延伸装置

Longitudinal direction drawing equipment

横方向延伸装置

Transverse direction drawing equipment

コロナ処理装置

Corona treatment equipment

巻取装置

Reel

【表１】

[Table 1]

合成紙の厚み	25μ	50μ	100μ	150μ	200μ	250μ
紙状層／樹脂層	1～3μ	1～10μ	1～20μ	2～30μ	5～30μ	10～30μ
中間層	23～19μ	48～30μ	98～60μ	146～90μ	190～140μ	230～190μ
紙状層／樹脂層	1～3μ	1～10μ	1～20μ	2～30μ	5～30μ	10～30μ

【表２】

[Table 2]

項目	合成紙の厚み			測定方法
	60μ	100μ	120μ	
比重（－）	0.70	0.70	0.70	ASTM D-1248
単位重量(g/m²)	42.0	70.0	84.0	JIS P-8124
光沢度（%）	25/110	26/110	26/111	TAPPI T-480
白色度（%）	97	97	97	TAPPI T-525
不透明度(%)	85	92	94	TAPPI T-425
粗さ（μ）	0.70	0.70	0.70	TAPPI T-555
表面抵抗（Ω）	10^{13}	10^{13}	10^{13}	EN 45014

【表３】

[Table 3]

項目	合成紙の厚み			測定方法
	60μ	100μ	150μ	
比重（－）	0.70	0.70	0.70	ASTM D-1248
単位重量(g/m²)	42.0	57.0	81.0	JIS P-8124
光沢度（%）	26/26	26/26	27/26	TAPPI T-480
白色度（%）	97	97	97	TAPPI T-525
不透明度(%)	89	94	96	TAPPI T-425
粗さ（μ）	0.70	0.70	0.70	TAPPI T-555
表面抵抗（Ω）	10^{13}	10^{13}	10^{13}	EN 45014

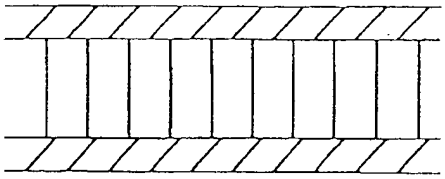
【表４】

[Table 4]

項目	合成紙の厚み			測定方法
	70μ	110μ	140μ	
比重（－）	0.70	0.70	0.65	ASTM D-1248
単位重量(g/m²)	49.0	77.0	91.0	JIS P-8124
光沢度（%）	110/111	112/110	109/110	TAPPI T-480
白色度（%）	85	87	89	TAPPI T-525
不透明度(%)	85	92	94	TAPPI T-425
粗さ（μ）	0.6	0.6	0.6	TAPPI T-555
表面抵抗（Ω）	10^{13}	10^{13}	10^{13}	EN 45014

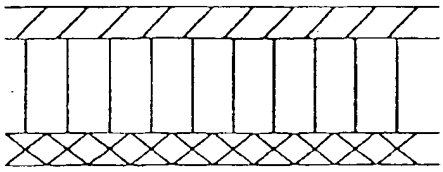
【図１】

[Figure 1]



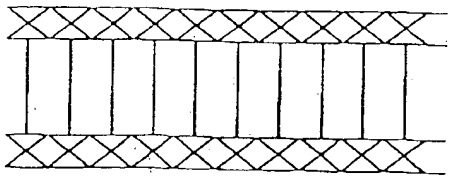
【図２】

[Figure 2]



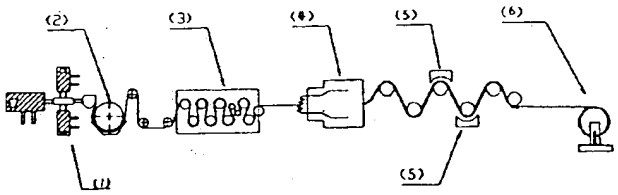
【図３】

[Figure 3]



【図４】

[Figure 4]



PlasticsTechnology Online
The Definitive Web Resource for Plastics Proce

New York, N.Y. Gardner Publications

The New Look in Plastic -- It's Paper!

By Jan H. Schut, Senior Editor

Synthetic paper based on filled polyethylene or polypropylene film has been around for decades without causing much excitement--until recently. "The overall plastics industry is growing around 4% a year, but synthetic papers are growing double that, at 8%," says Micke Mishne, president of Advanced Polymers, a consultant on printable plastics in Medina, Ohio. A long-time preserve of just a few large producers, paper-like blown and cast films are now attracting a handful of new players, as well as capacity expansions by the majors.

Still, success in this niche market doesn't come easily. Formulating is a black art, though off-the-shelf masterbatches now make it easier to get started. Also, many printers and converte are still wary of plastic's higher cost and density than cellulose paper. Thus, despite growing applications, plastic paper can still be a tough sell.

Synthetic paper targets high-priced niches like beverage labels, restaurant menus, drivers' licenses, recipe books, instruction manuals, maps, and book jackets. It folds, looks, and feels just like high-quality paper, except that it won't tear, puncture, or absorb water. It can be printed using virtually any conventional offset or gravure printing process, but only with solvent-based inks, unless it has a coating or surface that will accept water-based ink.

The first synthetic paper, called Ucar, was launched in the late 1960s by Union Carbide Corp. The market today is dominated by a handful of large, global ventures with proprietary technologies, each making a distinctive product. Yet the whole synthetic-paper market may not be much over 500 million lb/yr worldwide, estimates Jack Smith, sales manager of Hop Industries in Garfield, N.J. Hop distributes a synthetic paper recently introduced from Taiwan by Nan Ya Plastics, whose U.S. headquarters is in Houston. Smith's estimate excludes plastic products that replace paper but do not actually mimic its properties. (Examples include DuPont's Tyvek nonwoven and Van Leer's Valeron cross-laminated film.)

Spurs To Growth

Several factors are behind the recent expansions in synthetic paper and the entrance of new players and products. In Europe, synthetic paper is benefitting from the drive to replace PVC film for environmental reasons. In the U.S., synthetic paper fills more durable applications where its high cost can be justified, such as menus, maps, posters, game boards, and manuals. In Latin America, synthetic paper is actually cost competitive with cellulosic paper because of high duties on imports of the latter.

Another factor is plastic labels, which increasingly substitute for paper on beverage and juice bottles. Multi-wall paper bags and pouches are also converting to plastic-paper sacks. In Europe, some multi-wall paper sacks for pet food have switched to synthetic paper from Harrier Packaging in Peterborough, U.K., a start-up company making three-layer HDPE synthetic paper.

There are also new markets developing for paper-like films somewhere in between traditiona

plastic films and high-end synthetic paper. True synthetic paper tends to match all the traits of paper--like bright whiteness, opacity, water-based ink adhesion, scratch resistance, stiffness, deadfold properties, puncture strength, low coefficient of friction, and more balance MD/TD strength. Newer paper-like films may have some but not all of these traits--e.g., they may be printable but not as stiff as paper.

An example was the conversion in the early '90s of air-courier envelopes from paper to highl filled monolayer films, which were coated to give paper whiteness and opacity, though they were still readily distinguishable from paper. More recently, Next Generation Films Inc. in Lexington, Ohio, entered this market with a three-layer coex blown film that's opaque white on one side (thanks to special fillers) and silver on the other. The product is said to have inherent cost advantages because a multi-layer structure can run a wider bubble and thinner stronger film. Next Generation extrudes it on equipment from Hosokawa Alpine American.

What's Holding It Back

Lack of familiarity with plastic paper and reluctance to change on the part of printers, converters, and end users are still retarding growth of this market. Another problem is that synthetic paper can weigh more per 1000 sq in. than cellulose paper. "It's been a tough market to penetrate because of the film's weight," says Bill Steen Sr., v.p. of WBC Extrusion Products in Haverhill, Mass., which launched a product two and a half years ago but is still only semi-active in the market. Blown and cast-film processors are exploring multi-layer constructions to permit downgauging so as to cut weight and cost.

Everywhere except in Latin America, growth of synthetic paper is limited by price. Ten years ago, it cost four times more than paper in the U.S. Now Advanced Polymer's Mishne says the ratio is down to 3:1 and, for some products, 2:1.

Added to the higher material price is the potential for higher printing costs on plastic paper. "There may be higher waste and higher ink cost at the printing level," says Jordan Katz, president of Grafix Plastics, a film converter in Cleveland that sells to printers. His customers say printing on synthetics is slower, and the film stretches more than paper, making print registration trickier. These factors require a printer to be knowledgeable about using plastic webs. Still, Katz says, "Every time I get frustrated with synthetic paper, we get another orde for it. Every year we do more and more of it."

Opacity Is In The Pits

Formulation know-how and film structure are the keys to overcoming obstacles of cost, weight, and printability. While much is proprietary in this field, several different resins and fillers are known to be used. Some paper-like films are monolayer, while others are three-layer coextrusions. Some also rely on surface coatings.

Whiteness, opacity, and printability are all achieved with the use of inorganic fillers at typica levels of 20-30% by weight. The filler itself contributes to opacity and ink adhesion, as well a impact strength and deadfold properties, though it decreases puncture strength and adds weight.

Filler particles also contribute to the phenomenon of cavitation, or formation of microscopic surface pits and voids in the film that entrap ink and add whiteness and opacity. Cavitation occurs when the heavily filled film is stretched, either through slight machine-direction orientation of cast film or through blowing a bubble in blown film. The stretch ratio in synthetic paper is slight compared with conventional biaxial orientation, but it is enough to pull the resin away from mineral particles, creating the micro-voids that scatter light and pits that hold ink. Voids can also help offset the weight of the filler.

The three biggest synthetic-paper producers all use different fillers. The Teslin Products div. o PPG Industries, Barberton, Ohio, uses Hi-Sil, an absorptive precipitated silica made by anoth

division of PPG. Yupo Corp., a unit of Oji-Yuka Synthetic Paper Co. (a joint venture between Oji Paper and Mitsubishi Chemical), uses mica. Arjobex in the U.K., a joint venture of BP Amoco and Arjo Wiggins & Appleton Papers, Appleton, Wis., uses calcium carbonate. All use TiO2 for opacity.

Transilwrap Co. of Franklin Park, Ill., one of the smaller long-time producers of synthetic paper, uses talc-filled PP for its ProPrint product, which is used for stereo speaker cones. A white version is offered for printing. Transilwrap uses a talc/PP compound from A. Schulman Inc.

Particle size has an effect on opacity, notes filler supplier J.M. Huber Corp. Finer particles in many cases raise opacity and reduce the need for costly TiO2. Huber also notes that functionalizing the surface of the filler improves ink adhesion, impact strength, and lay flat.

Resin choice also plays a big role in synthetic paper attributes. For example, PP gives better tear resistance, while HDPE gives better stiffness for bag making. HDPE is usually required to give a sharp deadfold. Fractional-melt HDPE is one route, but HDPE is brittle unless it's blown with a high-stalk bubble. Hanmere Polythene in the U.K. has made Hankraft synthetic paper with fractional-MI HDPE for over seven years.

Newcomers to plastic paper today have the option of purchasing some formulating know-how off the shelf. A. Schulman offers a series of masterbatches called Papermatch. They were introduced in Europe eight years ago but just three years ago in the U.S. As an indication of how complex synthetic-paper formulations can be, Schulman combines six to 10 different minerals, additives, and resins in its Papermatch concentrates, which can be tailored to make paper-like films ranging from imitation white bond to brown kraft. Papermatch originally used MMW-HDPE and HMW-HDPE carriers but now also uses polymers compatible with a low-stalk bubble process. Some of Schulman's newest formulations may contain up to 20% ethylene methacrylic acid copolymer. Other recent grades are aimed at multi-layer cast films.

Coextrusion adds further formulating options. A multi-layer film allows you to blend in lower-cost resins and still achieve downgauging, says Next Generation president Dave Frecka. "I ca use as many as nine different resins, including cheap butene LLDPE," he says.

Coatings are another variable for making paper-like films. Clay coatings similar to those applied to paper and typically 5 microns thick can improve tear strength, scratch resistance, and printability with aqueous inks. One early player using such coatings is Clear Cast Technologies in Ossining, N.Y., which has made Plastiprint synthetic paper since 1987. Clear Cast buys blown film and applies the coating. It uses four substrates for different types of synthetic papers: HDPE film for a rigid type, a proprietary PE blend for flexible "paper," uv-stabilized HDPE film for outdoor use, and a lower-cost PE film for indoor use.

The Big Three Expand

Historically, the big producers of synthetic paper were joint ventures of paper and resin companies. Their technologies developed separately in Europe, Japan, and the U.S. Union Carbide's technology has passed through different hands and now belongs to Arjobex. It makes Polyart synthetic paper at three plants in the U.S., U.K., and France. Arjobex doubled the capacity of its U.S. plant in Charlotte, N.C., last year and began exporting to South America, where synthetic and cellulosic paper are evenly matched in price.

Polyart is HDPE compounded with TiO2 and calcium carbonate on a twin-screw extruder that directly extrudes film through a flat die and simultaneous biaxial orientation. Rolled stock is clay coated using two doctor coating stations from Black Clawson. Polyart film is 3.2 to 12 mils thick. Recent developments have been aimed at thicker and whiter films. Arjobex is also close to introducing its first new trademarked synthetic-paper product in over 15 years. It should appear in Europe in the first quarter and in the U.S. by mid-year.

Yupo Corp. launched a filled-PP synthetic paper in Japan in the late '60s. Yupo makes it unde the Kimdura name for Kimberly Clark. Two years ago, Yupo opened a U.S. plant in Chesapeake, Va., and began making the same product under its own name for different markets.

PPG's Teslin Products div. started making synthetic paper in 1987. It added a second line a few years later and is installing a third line this year. Teslin uses a mixture of PE and clear mineral oil, highly filled with precipitated silica. This mix is calendered, and then the oil is extracted after calendering, leaving a porous structure like honeycomb. Porosity makes Teslin printable with either water-based or solvent-based ink without any additional treatment because the ink soaks into the pores.

Teslin is said to be the only polyolefin-based synthetic paper that can be used in laser copyin machines. Oriented films like Yupo's and Arjobex's would shrink when exposed to the 375-47 F heat used to fuse the laser toner. Teslin is now commercializing a new coated material for inkjet printing.

Porosity lowers film density, so a sheet of Teslin has a lower basis weight than other synthetics--and less stiffness, too. Porosity also gives Teslin a niche in tamper-evident films for drivers' licenses and other I.D. cards. When Teslin is laminated to another film, the secon film enters the Teslin pores, so any attempt to delaminate pulls the substrate apart.

Enter New Players

In the past year or two, new firms, large and small, have gotten into synthetic paper and other films with paper-like properties for labels, tags, and the like. Four years ago, Nan Ya (a unit of Formosa Plastics in Taiwan) entered the market with a calendered, monolayer PP film filled with calcium carbonate. It's made in Taiwan and sold under several names by distributors, including Hop-Syn sold by Hop Industries.

Nan Ya has just developed another paper-like product called Dura-Lite, a three-layer structur of PP with a clay coating for extra tear strength. Dura-Lite comes in thinner gauges--2.8-7.2 mil vs. 3.2-34 mil for Hop-Syn. Both target tags, labels, and offset printing and are corona treated for enhanced printability.

Another recently developed Nan Ya synthetic paper is marketed as Polylith by Granwell Products, West Caldwell, N.J. The "G" series is calcium carbonate-filled PP oriented in the machine direction to reduce specific gravity. A newer "P" series is BOPP with TiO2 and a copolymer skin layer. Markets include prepaid phone cards and in-mold labels.

Three years ago, Mobil Chemical Films Div. (now ExxonMobil Films), Macedon, N.Y., started making synthetic-paper face stock for its Label-Lyte offset-printed beverage labels and for thermal-transfer printed, pressure-sensitive labels. The stock is coextruded OPP that's clay coated for a paper feel.

Last year, American Profol Inc. in Cedar Rapids, Iowa, launched ProPaper, a family of synthetic papers based on three-layer cast PP films. American Profol blends other resins into the PP core layer to get a softer feel and cold impact strength. The films can be used outdoor for cold-weather applications like ski tags and labels for gas bottles.

In the U.K., Harrier Packaging in Peterborough is a new firm making a three-layer coextruded blown film using a fractional-melt HDPE core and heavily filled HDPE surface layers to give "PaperFeel" its paper-like stiffness and deadfold. The material is blown on a three-layer coex line from Battenfeld Gloucester similar to lines used for heavy-duty sacks. Film is converted on a standard SOS (self-opening sack) bag machine.